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**PRESIDENCY UNIVERSITY
BENGALURU**

SCHOOL OF ENGINEERING

MAKE UP EXAMINATION – JAN 2023

Course Code: EEE1006

Course Name: Smart Sensors for Engineering Applications

Program : B.Tech

Date: 27-01-2023

Time: 9:30 am to 12:30 pm

Max Marks: 100

Weightage: 50%

Instructions:

- (i) Read the all questions carefully and answer accordingly.
 - (ii) Scientific/ Non programmable calculators are allowed
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Part A [Memory Recall Questions]

Answer all the Questions. Each question carries ten marks.

(10Qx 2M= 20M)

- 1 _____measures temperature by correlating the resistance of the RTD with temperature.
 - a) Thermistor
 - b) Resistance Thermometer
 - c) Thermocouple
 - d) Semiconductor based sensor
- 2 _____consist of two different metals connected at two points.
 - a) Thermistor
 - b) Resistance Thermometer
 - c) Phototransistor
 - d) Thermocouple
- 3 Barometer is which type of sensor _____
 - a) Pressure sensor
 - b) Touch sensor
 - c) Temperature sensor
 - d) Humidity sensor
- 4 Touch screen devices use which sensor?
 - a) Touch sensor
 - b) Temperature sensor
 - c) Proximity sensor
 - d) Pressure Sensor
- 5 What is the use of accelerometer in laptops?
 - a) To rotate the screen
 - b) To protect hard drives from damage
 - c) To get the angle on monitor
 - d) To get the linear acceleration
- 6 Which axis accelerometer is mostly used in IOT?
 - a) 2-axis
 - b) 1-axis
 - c) 3-axis
 - d) Combination of all

7 How many and what are the parts that are present in the accelerometer sensor?

- a) 1, capacitor sensor
- b) 3, piezoelectric effect, Analog display, digital display
- c) 2, piezoelectric effect and capacitor sensor
- d) 2, Capacitor sensor, digital Display

8 _____ sensor is used for tracking rotation or twist.

- a) Gyroscope
- b) Temperature
- c) Pressure
- d) Proximity

9 A transducer is a device that converts energy from one form to another. Transducers may be classified according to their application, method of energy conversion, nature of the output signal, and so on.

_____ transducers require external power supply for their operation.

- a) Passive
- b) Inverse
- c) Active
- d) Secondary

10 _____ detects metals but along with it can also detect resins, liquids.

- a) Inductive proximity
- b) Capacitive Proximity
- c) Magnetic Proximity
- d) Parallel Proximity

Part B [Thought Provoking Questions]

Answer all the questions. Each question carries TEN marks

(5Qx10M=50M)

11 Mr. Shyam wants to build automated home which would sense the temperature automatically and accordingly it turns on and off the air conditioner. As he is very much concern about power saving, he wants to install sensor in his home to switch on and off the air conditioner. Please suggest any two sensor which would check temperature in regular interval and perform the aforementioned task.

(C.O.No.1) [Comprehension]

12 Assume that, you are the technical expert in a company that deals with automation. Presidency University wants to implement smart sensor-based systems for automation in class rooms. How would you explain to the concerned about the basic architectural components of such smart sensor systems?

(C.O.No.3) [Comprehension]

13 Ms. Anitha went to a shopping mall for purchasing garments. Before entering the mall, the security guard stopped her at the entrance for security check. The security guard used a non-contact sensor to detect the presence of any metal objects with that lady. A non-contact sensor uses wear-free technology, the sensor experiences no friction on the moving parts, and this eliminates wear and tear and mechanical failure. Comment on the type of sensor used and explain the working of it with neat diagram

(C.O.No.2) [Comprehension]

14 The remote of the projector is lost and the professor of the class wants to do this task by simply clicking one button in his hand. Kindly suggest the type of sensor which would help him to turn on the projector of the class. (C.O.No.3) [Comprehension]

15 A home automation system combines hardware and software via a wireless network to control your home electronics and appliances through one device which could be a smartphone, tablet, or a specific central automation control hub system. These devices can be controlled remotely even when you're not at home. Explain the types of devices that can be operated via a home automation controller and describe them in brief highlighting the role of smart sensors used in it

(C.O.No.3) [Comprehension]

Part C [Problem Solving Questions]

Answer all the Questions. The question carries thirty marks.

(2Qx15M=30M)

16. The piezoelectric effect results from the linear electromechanical interaction between the mechanical and electrical states in crystalline materials with no inversion symmetry. The piezoelectric effect is a reversible process: materials exhibiting the piezoelectric effect also exhibit the reverse piezoelectric effect, the internal generation of a mechanical strain resulting from an applied electrical field. A piezoelectric crystal having dimensions of 5 mm x 5 mm x 1.5 mm and a voltage sensitivity of 0.055 V-m/N is used for measurement of force exerted. The voltage developed is 100 volts.

- a) Identify the unknown quantities that could be computed from the given data. [5M]
- b) Compute the unknown parameters. [10M]

(C.O.No.1) [Comprehension]

17 A linear resistance potentiometer is 50mm long and is uniformly wound with wire having a resistance of 10000Ω. Under normal conditions, the slider is at the center of potentiometer.

- a) Compute the linear displacement when the resistance of the potentiometer as measured by Wheatstone bridge for two cases are i) 3850Ω ii) 7560Ω. [10M]
- b) Are the two displacements in the same direction? [2M]
- c) If it is possible to measure a minimum value of 10Ω resistance with the above arrangements, find the resolution of the potentiometer in mm. [3M]

(C.O.No.1) [Comprehension]